PUTTING RESEARCH TO WORK BRIEF

Tablet PCs for Quick, Easy Entry of Bridge Inspection Data

The Wisconsin Department of Transportation has adopted a new system for bringing together bridge inventory, inspection, maintenance and maintenance cost data. The new Highway Structure Inventory System data consolidation project combines all bridge-related information into a single data warehouse. The new system renders WisDOT's existing field data collection tools and procedures obsolete.

What's the Problem?

The transition to the new system presented an opportunity to investigate alternative data collection tools for field use. Formerly, bridge inspectors had the option of filling out electronic forms on site with a notebook computer, but most found it impractical to use a keyboard in the field, opting instead to handwrite notes to be entered into the database later.

WisDOT developed database forms for submitting bridge inspection and inventory data to the HSIS via the Internet, but while the Internet forms work well for office use, they are inconvenient for field use. WisDOT needs a tool that accommodates emerging data-gathering procedures and that is suited to field use so inspectors can record data safely, easily and rapidly.

Research Objectives

This project aimed to investigate technologies that would allow bridge inspectors to take the new Web-based inspection forms to the field for data collection at the bridge site. Specific objectives included:

- Configure a user-friendly field inspection tool that suits existing inspection practices.
- Test and evaluate the tool and its benefits.
- Recommend an implementation strategy.

Methodology

Researchers drew from implementation models used to reduce resistance to technological change. Technologies considered were personal digital assistants, Tablet PCs and wearable PCs. The process entailed:

- Performing a literature survey.
- Evaluating potential tools.
- Enlisting bridge inspectors from six districts and the central office to help select technologies, test the preferred option in the field, and provide weekly feedback to researchers.
- Assessing the cost-effectiveness of the selected technology.

Results

Researchers found the Tablet PC to be a viable, time-saving tool for collecting bridge inspection data in the field. With some effort, inspectors were successful in learning to use the handwriting recognition technology and were enthusiastic about the Tablet PC's benefits.

Existing handwriting technology was found to be superior to speech recognition technology. Combined with a new electronic version of the Inspector's Pocket Manual that is hyperlinked to the inspection form, the technology promises to facilitate greater detail, accuracy and consistency in reports. Economic analysis showed that Tablet PCs would pay for themselves through time savings in 10 to 16 months, or 120 to 200 bridge inspections.

Investigator

"This is a very promising system that could save a lot of time and paperwork."

–Teresa M. Adams
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With its swiveling display and handwriting recognition, the Acer Tablet PC offers WisDOT bridge inspectors easy access to the bridge management database in both the office and the field. (Photos courtesy of Acer America Corp.)

Tablet PCs are suitable for both field and office use. With a shoulder strap and carrying case, the Tablet PC allows inspectors to record data while standing on site. Convertible-type (rather than slate-type) Tablet PCs add the option of use as a notebook PC in the field or the office.

Implementation

Researchers recommend full deployment of the Tablet PCs to replace retiring notebook computers and field inspection tools. Specific findings and recommendations include:

- Convertible-type Tablet PCs are preferred over slate-type, because they can also function as a notebook PC in the office or the field. When possible, some inspectors prefer to use the mechanical keyboard attached to a convertible Tablet PC.
- Tablet PCs equipped with electromagnetic resonance (active) digitizers for handwriting recognition input are easier to use than those with pressure-sensitive (passive) digitizers.
- LCD technologies should be reevaluated at the time of purchase to find the best outdoor and indoor viewing combination. Treated transmissive screens appear to be the best option of existing technology.
- Inspectors need formal training on the Tablet PC, including how to use and customize the handwriting and speech recognition tools. The training used in this study was well received, and the final report includes training materials to assist WisDOT in developing its formal training.

Benefits

This research identified the Tablet PC as a simple, time-saving tool for reporting bridge inspection data. The use of this technology should produce more accurate, consistent and detailed inspection records, fully usable by the HSIS. In as little as 10 months, the technology will have paid for itself in time savings, and should also provide higher quality bridge management data.

Project Manager

"This research is already being implemented. We can electronically input bridge management information without having to download data. It's a more efficient process."

–Stan Woods
WisDOT Structures Development Chief
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WisDOT bridge engineers and inspectors from six districts contributed to this research.

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